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ABSTRACT

This paper addresses cognitive issues raised by the success of an early reading intervention program, Reading Recovery (originated in New Zealand and also used in Australia and the United States,) in which the great majority of students move from low reading achievement to average achievement for their age group within 12-15 weeks. The first section of the paper maintains that low achievers demonstrate fewer and less efficient use of the interacting strategies involved in reading acquisition. Also addressed in this section is the assertion that while some approaches seek to break the cycle of interacting deficits with a single emphasis treatment program for all children, the Reading Recovery program posits a complex model which assumes that the child is constructing a complex read/write action system which will only work efficiently if all subcomponent skills are being acquired, and that the child needs to learn in ways which foster an independent, self-improving way of functioning. The second section of the paper deals with the instructional implications of such a model, involving individualized instruction within a standardized framework of lesson activities to ensure daily coverage of the necessary subcomponent skills, primarily in a meaningful context. The third section describes the 30-minute daily lesson and the cognitive issues involved. The fourth section of the paper describes the progressive changes which occur as children move from interacting deficits to a self-improving system, and the final section discusses developmental issues. One table is included, and 16 references are attached. (SR)

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STUDYING DEVELOPMENTAL CHANGE WITH A SUCCESSFUL INTERVENTION

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ABSTRACT

A review of research on reading processes (Stanovich, 1986) raised questions which are important for the design and interpretation of developmental research and in particular, causative factors. His questions were about a) variables which have a continuing high input for both skilled and less skilled readers, b) those which have reciprocal effects such as cognitive variables affecting reading and vice versa, c) those which are important early in acquisition but have developmentally limited effects on later progress, and d) those which are believed to impose developmental lags. Data from studies of a successful intervention mounted in three countries (NZ, Australia and USA) with children in their second year at school support the arguments that text reading supports the progress of low achievers, that writing is involved in reciprocal contribution to reading gains, that phonological awareness can be an early outcome variable from early writing rather than an input variable of the beginning phases of reading acquisition, and that the effects of developmental lags can be minimized in individually designed and delivered programmes.

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Reading Recovery is an early intervention programme used in three countries (Clay,1987a) to undercut reading failure. It is a programme that requires a high level of training and quality implementation to achieve good results. In 1987 in New Zealand 15% of the lowest achievers after one year at school received individual instruction (i.e. 15% of the birth cohort of 50,000 children). The children are selected only on achievement criteria: they are the poorest achievers in the age group after one year of good quality classroom instruction. No child in ordinary classrooms is passed over for any other reason; there is no selection out because of such variables as low intelligence, motor inco-ordination or low oral language scores.

Within one school year about two-thirds of the intervention children reach average band performance for their classes, which is the required criteria for discontinuing their programme. Time in programme on the average is between 12 and 15 weeks and an arbitrary upper limit to treatment of 20 weeks has usually been set in the interests of cost effectiveness. Close to another third (who enter late in the initial year) complete their programme to criterion levels in the following year. In New Zealand only about 1% are referred for special reports and further specialist instruction. They have been identified by six and a half years of age following one year of good classroom instruction and 20 weeks of individually designed and delivered instruction, and they are a very hard to teach

group. They will have special difficulty learning that will require highly-trained teachers. The results discussed above are foreshadowed in research reports in Clay(1985) and reported in a recent paper submitted for publication including data supplied by the State Department of Education.

This paper addresses cognitive issues raised by the success of this programme with the other 14% of the age group. Pretests showed them to be in the low-achieving group but posttests placed them in the average band for class. Without the intervention some if not all of these children might have been categorized as children with specific learning difficulties in some education systems.

Breaking The Cycle Of Interacting Skill Deficits

Assuming that reading acquisition involves the learning of various interacting strategies which the reader uses to process many levels of information in a text then low achievers demonstrate fewer and less efficient use of such strategies. Studies have shown that low achievers show one or more of the following outcome deficits: they avoid reading and do less of it; they act passively in print situations, they cease to use cognitive strategies on text problems; they avoid phonological discriminations if these do not work and try to depend on some other mode of word-solving.

One approach to breaking a cycle of interacting deficits is to select a variable which is developmentally important and through interventions of small magnitude try to establish the genesis of large differences. Stanovich (1987) suggested phonological awareness was such a variable; Bradley and Bryant (1983) used a simple task to demonstrate the links between letters and sounds and achieved important gains in reading scores with advantages sustained at follow-up years later. Bryant and Bradley (1985) suggested raising the phonological skills of all children as if a threshold effect in this area could dismiss reading difficulties. This approach to the problem of reading difficulties allows research to explore single variable causation with experimental methodologies.

Another approach has been to devise a particular instruction procedure or package and to deliver this to children selected according to a particular definition of reading failure, usually excluding children of low intelligence. The research design of choice is a control group comparison design and the programme would be supported if significantly greater progress were made by children in the treatment programme. There are very few reports of such studies (Gittleman,1985) and only one showing significant gains which were lost at follow-up a few months later (Gittleman, and Feingold, 1983). In this approach treatment of a more or less standard type is delivered to children with diverse

difficulties.

A third approach is to begin with an assumption that the child is constructing a complex read/write action system for approaching printed language which will only work efficiently if all subcomponent skills or strategies are being acquired. The various interacting skills allow the reader to extract and integrate many levels of information in a text so that error-free message reception is possible. With such a model there is no simple way to read or write in which one can do without language, or understanding, or visual cues, or phonological cues or knowledge of the printer's conventions. Low achievers will have to move through the achievements of average readers in all such variables to become effective readers because there is no simplified way to engage in the complex activity. Once readers are competent they do a large amount of independent learning becoming even more competent as a result - Stanovich (1986) called this the Matthew effect in reading. The competent reader is building a self-improving system (Clay, 1979) or benefittiing from a bootstrapping effect (Stanovich, 1986). Low achieving readers will also need to learn in ways which foster this independent, self-improving way of functioning. Using a model of reading as a complex activity one would not seek to break the cycle of interacting deficits with a single emphasis treatment programme for all children at risk, or even for a subgroup.

Instructional Implications of a Complex Model

The two assumptions of complexity in interacting processes and different sources of difficulty in different low achievers are met by individually designed and individually delivered instruction. A delivery system of one to one instruction was required so that a well-trained teacher keeping good records could be fully aware of all aspects of the pupil's learning history in the second chance programme.

A standard framework of lesson activities was used to ensure daily coverage of the necessary subcomponent skills or strategies in the reading process model. The type, order and sequence of the activities in the lesson keep both teachers and low achievers interested and can be completed in the daily thirty minute lesson in a brisk yet unhurried teaching session (Clay,1985).

As the basis of selection of pupils was low achievement pupils admitted to the intervention would differ greatly one from the other on entry and would have different strengths. Instruction must allow for the use of different patterns of strengths and weaknesses in different children. The one to one teaching format allowed the teacher to match the style and content of her interaction to the needs of a particular child at a particular time on a particular text. Opportunities for conversation about the texts was increased for children with poor oral language skills and decreased for those with good oral language skills. Time

for talk (oral language work), attention to comprehension, increasing reading and writing vocabularies, hearing sounds in words, orchestrating these behaviours, monitoring the results and self-correcting by independent problem-solving might be adjusted according to the strengths or weakness in a particular child's reading/writing action system. Whatever aspect of the complex processing system was difficult for a pupil the lesson format allowed for the child to achieve success on a task of appropriate difficulty with teacher support while the teacher laboured away at the problem responses undercover of the child's successes in using his most competent responses.

Every activity in Reading Recovery (reading or writing) takes place at the level of intact text messages and any attention given to sounds, words or letters is a temporary change of gear with the intent of returning to the text level of processing with more information. Teaching tries not to dismember the task, and not to destroy effective response systems.

Independent operation of the reading and writing system is passed to the child for the things he controls starting in the first week of the intervention. The reader must develop independent processing skills which increase reading by reading and writing by writing and to achieve this the teacher will focus on meaning as a external guidance mechanism and a source of error detection when responses do

not make sense, call for active, constructive, independent problem-solving, reinforce good quality information processing even when an incorrect response is given, and make teaching points about sources of information from incidents of successful processing by the child.

In summary, the use of a model of diversity and complexity grounded in field research on successful learners to develop a programme for children at-risk determined the following features of instruction.

1. The teacher would need to make maximum use of any existing response repertoire.
2. The teacher would support the development of a read/write action system by astute selection of tasks, sharing of tasks, and varying the time, difficulty, content, interest and method of instruction and type and amount of conversation within the standard lesson activities.
3. The teacher would foster and support active constructive problem-solving and self-monitoring and self-correction. To do this the teacher would focus on process variables (how to get and use information) rather than only on correct outcomes and would value responses that were partially correct.
4. The teacher would, however, set task difficulty to ensure high rates of correct responding so that an active processing system which learns from its own operation would form.

The Thirty-Minute Daily Lesson

It is in the detail of the tasks of the daily lesson (Clay, 1979) that I want to argue the cognitive issues and an overview is presented in Table 1. While what is taught within each slot in the lesson framework is determined by the child's strengths and competencies and stage of progress, the activities of the lesson remain more or less the same throughout the time of instruction. The rationales for the activities relate to the cognitive issues.

Moving up through a gradient of text and task difficulty children read and write a lot daily (they may read five or six little stories and write a sentence or two). This provides opportunities

1. to orient to, talk over and understand a new story every day (developing comprehension strategies).
2. to revisit known vocabulary in novel contexts increasing familiarity (gaining direct access to some vocabulary).
3. to reconstruct recent successful experience and to orchestrate complex interacting processes on partially known material (developing active text processing strategies).
4. to use component skills immediately in text settings and add to those skills at the frontiers of what they already control.
5. to use writing as a resource for reading and vice versa,

(a kind of double chance for bootstrapping to occur).
6. to segment words in speech and in print and relate the two (phonological awareness as an outcome of reading and writing).
7. to anticipate, monitor, and self-correct, guided by meaningfulness, while accessing background knowledge (near-simultaneous integration of information from more than one level of text).

Those activities in which the child engages each lesson relate to the psychological processes described in current models of reading or reading and writing acquisition. They deal with text meaning and comprehension; direct access to known vocabulary by visual recognition; problem-solving new texts using visual, phonological, word, syntactic, language, and world knowledge interactively (and not in isolation); and operating error-detecting and correcting strategies.

From Interacting Deficits to A Self-Improving System

What would be the progressive changes through which children might be expected to move? Most theorists use a model of the possible progressions in beginning reading derived either from a study of the normal progress of competent readers to hypothesize the type and trajectory of changes to be expected (Chall, 198 ; Ehri, 1985) or from children with reading problems (Frith, 1986). Unfortunately the progressions researchers are able to observe are mainly the outcomes of the input programme of instruction that was

delivered to the research population in schools prior to the model-building research. Reading Recovery did not escape this problem: however, it was guided by descriptive research from a programme in which text processing was the focus of instruction with any component skills taught only in the service of text processing (Clay,1982). Changes in processing behaviours were monitored over very short periods of time (weekly intervals) and in all their variety (i.e. children were seen to take different routes to similar goals).

The cycle of interacting skill deficits is broken by the child's mounting control of some types of information processing. Signs that this is occurring are 1) that the rate of acquisition accelerates faster than learning by average classmates, 2) that work on novel texts generates more surpisingly 'good' responses than 'problem' responses, 3) that the need for teacher support, guidance, input, or questioning is diminished, and 4) that the child can work independently with success on novel literacy tasks.

Some of the changes that occur over the 12 to 15 weeks of an average series of lessons are that letter identification and Concepts About Print come to require little attention as they are closed sets of information which become mastered; the child gains an independent control over hearing sounds in words in writing and tries new words independently, and the child who at first uses different

sources of information separately in sequence to read text comes to use meaning, syntax, visual and perhaps sound cues if not simulataneously then at least as if having orchestrated effective and rapid processing of several sources of information.

Developmental Issues

There seems to be no hope of studying causative factors in a theory that hypothesizes that interrelationships rather than single variables are important but neither is there any chance of denying the thousands of replications of the change process demonstrated by each low achieving child who reaches criteria for discontinuing in this programme. It is important to note that this has been shown to occur in many different education systems (New Zealand, Victoria and Canberra in Australia, and hundreds of different education systems in the State of Ohio in USA.)

Accepting for the sake of argument that satisfactory results occur in this intervention partly as a result of these daily activities and their rationales I want to address Stanovich's developmental questions. He saw his review 'not so much as a complete model of the development of individual differences as an outline to be filled in by future research.'

He argued that the use of context cues does not discriminate skilled and unskilled readers and is therefore not a

significant variable in reading failure. Reading Recovery experience would suggest that the availability of meaningful context provides a necessary framework for embedding component reading skills directly in their interactional relationships during instruction rather than practising them in isolation. In particular, working with semi-familiar stories which are enjoyable if re-read several times provides the opportunity to practice such skills that low readers often do not get (Allington, 1984). It seems that diagnosis of what has broken down is a poor indicator of how the repair can best be carried out. As in more practical crafts the repair must be anchored in a context where everything is firmly in place and functioning well.

Stanovich argued that research shows phonological awareness to be important for reading but like most researchers in this area he did not clarify whether he saw phonological awareness as input or outcome of an instructional programme. If we observe responses which are outcomes of learning and build direct instruction of those outcomes into lessons we do not ensure that the strategic and generating processes necessary to sustain independent functioning are being formed. Phonological awareness is effectively developed in Reading Recovery not by teaching phonics but by the child listening closely to the sounds in words he wants to write and learning from writing activities about the consistencies of sound and letters relationships.

In another paper Stanovich(1987) wondered whether invented spelling (Read, 1986) might be an important activity for focussing children on sound-letter links. Through writing self-composed messages daily in Reading Recovery the child builds up phonological awareness which is available for use in reading. He engages in a kind of invented spelling about which he and the teacher interact. The teacher asks the child to apply one source of knowledge ,talking, to help him in another activity, writing. She calls for the use of what is learned in writing when the child is reading. The message is 'search any knowledge you have to help you solve the problem.' Reading Recovery proceeds as if reading and writing can be used reciprocally as resources one for the other, and the children taught to search either store of knowledge. This means that the young reader has available to his reading action system not only the phonological awareness that arises from engaging in invented spelling, (defined as finding letters that might be a way to record the sounds you can hear in the words you speak) but also any other knowledge about clusters or chunks of letter-sound relationships that he acquires while writing messages and stories.

Different subgroups of children who succeed in the programme have been observed to have diffculties of different kinds - language, motor co-ordination, auditory analysis of the sounds in words or visual perception of the features of

print, or co-orination of any of these with getting messages from text but no studies of such subgroups within Reading recovery have yet been completed. The very high proportion of children succeeding in the programme suggest that any such lags have not prevented children from making the same progress as other children provided their strengths support active participation in reading and writing and provided the weaker areas of responding are given attention within the total task.

Stanovich (1986) identified a major problem for future research to be to determine whether instructional differences are a factor in generating the Matthew effect that the good readers get better and the poor readers get poorer in education. Perhaps one way to operationalize his suggestion and at the same time assist poor readers is to use interventions designed to break the cycle of interacting deficits and to record in detail the changes as they occur in particular facets of complex reading and writing activities. The Reading Recovery programme appears to provide such an opportunity. It uses the child's strengths as a means of producing volumes of reading and writing, it fosters independent constructive strategies to work on weaknesses anywhere in the interactive network drawing on current knowledge anywhere in the read/write action system. Imbalances that emerge as compensatory processing (also described by Stanovich, 1980) are minimized by the teacher who controls task difficulty.

Achieving these outcomes in one to one instruction cannot be taken as a guide to the use of derivative teaching strategies with groups or in classrooms. One to one instruction in this case means much more than close attention and more teacher time. It means a teacher who knows the child's response history in detail, who can act as the child's memory for previous successful responses, who adjusts his/her own response pattern and demands and the gradient of difficulty in texts according to her records of progress. The quality of the one-to one interaction, its reciprocity, and the manner in which independent control of task is passed to the child as and when it is known that he is likely to succeed are qualities of teaching that are difficult to repeat in a small group situation and impossible in a class however small the numbers.

Scientific study of reading difficulties and perhaps also the modern techniques available to neuropsychology seek to isolate univariate or limited multivariate clusters in outcome behaviours. It seems highly likely that reading instruction, on the other hand, must develop complex learning with reciprocal relationships, feedback systems, self-correction processes and anticipatory or feedforeward systems a) where they do not exist and b) in partially developed response repertoires. The question arises "To what extent can the former really inform the latter?"

How then do most children learn to read? As active constructivists they are probably able to use the opportunities they get, in school and out of school, to create for themselves a read/write action system which the Reading Recovery teacher has to help her pupil to build through the supported interaction of one to one instruction.

A Thirty-Minute Reading Recovery Lesson

TABLE 1

Activity	Requirement	Cognitive Issue	Actions Observed
Rereading several familiar texts	Books read before still presenting processing challenges.	Allows reading volume. Comprehension leads. Successful processing.	Visual word recognition. Direct access. Orchestrates efficient processing.
Yesterday's new book	Second reading. No teaching. Behaviour record.	Independent use of what was introduced yesterday.	Reconstruction of a near-novel experience.
Letter Identification	Use magnetic letters. Extend range, & fluency.	Related to challenges in prior or upcoming new text.	Fluency with any form or feature, or links, in isolation or embedded.
	Limited word family and word analogy work.	Use in text reading called for.	
Composing and writing own story.	Shared production, child or teacher or both.	Context-free decoding. Writing is segmentation.	Produce print versions of words and messages you can speak.
	Hearing sounds in words.	Sound to letter consistencies	Phonological analysis
	High frequency words to fluency	Known in every respect	Speed recogniition & production

	Read and re-read.	Self-monitoring feedback, & feedforward processes.	Self-correction
Cut-up story	Reconstruction of teacher's copy of child's story.	Self-monitoring checking, self-correction,etc.	Monitoring and correcting movements.
Introduce new book	Text not read. Discuss sense, plot, climax, language,terms syntax,etc.	Model of orientation to text, accessing knowledge, using context, posing questions.	Participation in orienting to a new text.
First reading of new book.	Uninterrupted but with support. Some analysis at subword level usually after successful word-solving or new difficulties.	Complicated interactions. Testing ground for emergent cognitive links and strategies.	Independent on novel text.

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